EN

INSTRUCTION MANUAL - Translation of the original intructions

SHIPYARD	Item no 1665
To be matched only with items 382 and 383	

SYNSTAR	
SYNSTAR 350 TS	Item no 379

SYNSTAR	
SYNSTAR 400 TS	Item no 382
SYNSTAR 500 TS	Item no 383

TABLE OF CONTENT

This manual is part of the overall documentation and is invalid unless it is used in conjunction with the following parts of the documentation that you can consult in the Support-Documentation section of the website welding.cebora.it

3301151	**General warnings**
3301297	**Cooling unit manual**

IMPORTANT - Before using this device, read the instructions in this manual and in General Warnings manual code 3301151 carefully and make sure you understand them.
Always keep this manual at the place where the device is used.

The equipment can only be used for welding or cutting operations. Do not use this device to charge batteries, defrost pipes or start motors.

Only expert staff can install, operate, maintain and repair this device. An expert staff member means someone who can judge the work assigned to them and recognise possible risks based on their vocational training, knowledge and experience.

Liability regarding system operation is expressly limited to the system's function. Further liability of any kind is expressly excluded.
Any use that differs from what is expressly indicated and is implemented in different ways or contrary to what is indicated in this publication amounts to improper use. The manufacturer declines any liability arising from improper use that may cause accidents to people and possible system malfunctions.
This exclusion of liability is acknowledged upon commissioning of the system by the user.

The manufacturer is unable to monitor compliance with these instructions or device installation, operation and use, and maintenance conditions and methods provided in General Warnings manual code 3301151.

Observe the accident prevention regulations and the regulations in force in the country of installation (for example IEC EN 60974-4 and IEC EN 60974-9).

Inappropriate execution of the installation may lead to material damage and consequently to personal injury. Therefore, no liability is assumed for loss, damage or cost arising out of or in any way connected with improper installation, incorrect operation or inappropriate use and maintenance.
The manufacturer therefore disclaims all liability for malfunctions or damage to its welding/cutting power sources and system components resulting from improper installation.

The welding or cutting power source complies with the regulations set out on the power source technical data plate.
Use of the welding or cutting power source built into automatic or semi-automatic systems is permitted.
The system installer is responsible for checking the complete compatibility and correct operation of all components used in the system.

It is forbidden to connect two or more power sources in parallel without the prior written authorisation of the manufacturer, which will determine and authorise the procedures and conditions for the required application in compliance with current product and safety regulations.

1 SYMBOLS

The colour of the box indicates the category into which the operation falls: DANGER, WARNING, CAUTION, NOTICE or INSTRUCTION.

DANGER	Indicates a situation of **imminent** danger that could cause severe injury to people.
WARNING	Indicates a situation of **potential** danger that could cause severe injury to people.
CAUTION	Indicates a situation of potential danger that could cause slight injury to people and material damage to equipment if not respected.
WARNING	Provides important information to the user that could lead to damage to equipment if not observed.
INSTRUCTION	Procedure to be followed to achieve optimal use of the equipment.

2 WARNINGS

DANGER

Before handling, unpacking, installing and using the welding power source, it is obligatory to read the General warnings manual code 3301151.

2.1 Lifting and transport

DANGER

For lifting and transport methods, refer to General warnings Manual code 3301151.

3 INSTALLATION

WARNING

The machine must be installed by professional personnel. All connections must be carried out according to current regulations, and in full observance of safety laws (CEI 26-36 and IEC/EN 60974-9). The power source is turned on and off using switch 15.

3.1 Mains connection

WARNING

Connecting high power devices to the mains could have negative repercussions on mains power quality. Line impedance values lower than the Zmax value indicated in the Technical specifications table may be required for compliance with IEC 61000-3-11 and IEC 61000-3-12. It is the responsibility of the installer or user to ensure that the device is connected to a line of correct impedance. It is advisable to consult your local electricity supplier.

DANGER

- Make sure that the mains voltage matches the voltage indicated on the specifications plate of the welding machine. Connect a plug of adequate capacity for the current consumption I1 indicated on the data plate. Make sure that the yellow/green conductor of the power cable is connected to the plug's earth contact.
- If mains power extensions are used, the cable supply cross-section must be appropriately sized. Do not use extensions longer than 30 m.
- It is essential to use the device only if connected to a power supply with an earth conductor.
- Using the device connected to the mains without an earth conductor or to a socket without a contact for this conductor constitutes very serious negligence. The manufacturer declines all responsibility for damage to people or property that may occur.
- The user is bound to have the efficiency of the earth conductor of the system and the device in use periodically checked by a qualified electrician.

3.2 Environmental and storage conditions

The device must be installed and operated only on an appropriate, stable, flat surface and not in the open air. The user must ensure that the ground is flat and not slippery and that the workplace is properly lit. Safe use of the device must be ensured at all times. The device can be damaged by particularly high quantities of dust, acids, gases or corrosive substances. Prevent the device from coming into contact with high quantities of smoke, steam, oil mist or grinding powders! Poor ventilation will result in reduced performance and damage to the device:

- Observe the recommended environmental conditions.
- Leave cooling air inlets and outlets unobstructed.
- Leave a minimum distance of 0.5 m from any obstructions.

Ambient temperature range under working conditions from -10 °C to +40 °C, under transportation and storage conditions from -20 °C to +55 °C. Air relative humidity: up to 50% at 40 °C, up to 90% at 20 °C.

3.3 Gas cylinders

WARNING

Position the gas cylinders so that they are stable on a solid, flat base.
Secure the cylinders to prevent accidental falling: fasten the safety tape to the top of the gas cylinder. Never attach the safety tape to the cylinder neck.
Observe the gas cylinder manufacturer's safety instructions.

3.4 General Information

WARNING

- During power-on with a high-frequency strike device, keep the earth cable and torch cable at least 30 cm apart to prevent sparking between them.
- The cable bundle must not exceed a total length of 30 m. Never stand between the welding cables. Connect the earth cable to the workpiece that is as close as possible to the welding or cutting area.
- In applications with multiple welding sources, make sure that the cable bundles of each source are spaced at least 30 cm apart.
- In applications with multiple sources, each power source must have its own connection to the welding workpiece. Never use a shared earth for multiple power sources.
- Install and use the device only in accordance with the protection class indicated on the data plate. During installation, leave a gap of 1 m around the device to ensure that cooling air can flow in and out freely.
- The use of non-original accessories may compromise the correct operation of the power source and even the integrity of the system, rendering any warranty and liability cover that the Manufacturer may provide for the welding power source null and void.

3.5 Warning plate

The following numbered text reflects the numbered boxes on the plate.

B. Wire feed rollers can injure the hands.
C. The welding wire and wire feeder unit are live during welding. Keep hands and metal objects well away.

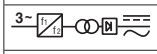
1. Electric shocks caused by the welding electrode or cable can be fatal. Protect yourself properly against the danger of electric shocks.
1.1 Wear insulated gloves. Never touch the electrode with bare hands. Never wear damp or damaged gloves.
1.2 Insulate yourself from the workpiece and the ground.
1.3 Disconnect the supply cable plug before working on the machine.
2. Inhaling fumes produced by welding can be harmful to the health.
2.1 Keep your head away from the fumes.
2.2 Use a forced ventilation system or local exhaust to remove fumes.
2.3 Use a suction fan to remove fumes.
3. Sparks generated by welding can cause explosions or fires.
3.1 Keep flammable materials well away from the welding area.
3.2 Sparks caused by welding can cause fires. Keep an extinguisher nearby and ensure that someone is ready to use it.
3.3 Never weld with closed containers.
4. Arc rays may injure the eyes and burn the skin.
4.1 Wear a safety helmet and goggles. Use appropriate ear protectors and overalls with the collar buttoned up. Use helmet masks with filters of the correct grade. Wear a full-body protection.
5. Read the instructions before using the machine or carrying out any operation on it.
6. Do not remove or cover warning labels.

4 GENERAL DESCRIPTIONS

The device is a multi-process system suitable for MIG/MAG welding and MMA welding (with the exception of cellulosic welding), developed with inverter technology. The device may be used only for the purposes described in this manual. The device must not be used to defrost pipes.

4.1 Explanation of technical specifications

This device is manufactured according to the following standards:
IEC 60974-1 / IEC 60974-2/ IEC 60974-5/ IEC 60974-10 (CL. A) / IEC 61000-3-11 / IEC 61000-3-12 (see note 2).

No.	Serial number, to be indicated on any request regarding the welding machine.
	Three-phase static frequency converter transformer-rectifier
 MIG	Suitable for MIG-MAG welding
 MMA	Suitable for MMA welding
U0	Secondary open-circuit voltage
X	Duty cycle percentage. The duty cycle expresses the percentage of 10 minutes during which the welding machine can run at a given current without overheating
I2	Welding current
U2	Secondary voltage with I2 current
U1	Rated supply voltage
3~ 50/60Hz	50 or 60-Hz three-phase power supply
I1 Max	Max. current consumption at the corresponding current I2 and voltage U2
I1 eff	This is the maximum value of the actual current consumed, considering the duty cycle This value usually corresponds to the capacity of the fuse (delayed type) to be used as a protection for the equipment
IP23S	Degree of housing protection Grade 3 as the second digit means that this device may be stored, but it is not suitable for use outdoors in the rain, unless it is protected
	Suitable for use in high-risk environments

NOTES:
1- The machine has also been designed for use in environments with a pollution rating of 3. (See IEC 60664).
2- This equipment complies with IEC 61000-3-12 standard provided that the allowed maximum impedance Zmax of the unit is lower or equal to 0.026Ω at the interface point between the user unit and the mains. The fitter or the unit user are responsible for connecting the equipment to a power supply with a maximum allowed system impedance Zmax lower or equal to 0.026Ω. If required, they may contact the electric power supplier to check this value.

4.2 Protections

4.2.1 Lock protection

If the welder malfunctions, a **warning** message may appear on display 1. This identifies the type of defect. If the message is still present after turning the machine off and on, contact the assistance service.

4.2.2 Thermal protection

This device is protected by a thermostat which prevents the machine from operating if the allowable temperatures are exceeded. Under these conditions, the fan continues to operate and display **1** shows the flashing WARNING code tH.

5 INSTALLATION AND START UP

The system must be installed by qualified personnel. Carefully read the “Staff obligations and qualifications” section in General Warnings code 3301151.
During transport of the device, ensure that applicable national and regional accident prevention guidelines and regulations are observed. This applies in particular to guidelines concerning transport and shipping risks.
Carefully read the “Lifting and transporting” section in General Warnings code 3301151

DANGER

Tipping a device over may endanger life! Position the device stably on a solid, flat base.
A maximum angle of inclination of 10° is allowed. Do not lift or transport live devices. The machine should not be positioned on sloping planes, to prevent tilting or any uncontrolled movement.

WARNING

To move the power source, fit the missing rear wheels and adhere scrupulously to the following instructions.
Disconnect the device from the power supply before moving it.
During transport of the device, ensure that all applicable local accident prevention guidelines and regulations are observed.

CAUTION

After transport or relocation and before operating, a visual inspection must be performed on the device to check for any damage.
Ensure any damage is repaired by qualified CEBORA authorised technical assistance staff before operating the device.
The capacity of the lifting device must be at least 20% greater than that of the load to be lifted.
When lifting the power source and the wire feeder, use only the eyebolts located on the top of the power source and on the wire feeder spool support.
All harnessing devices (straps, buckles, chains, etc.) that are used together with the device or its components must be checked at regular intervals
(e.g. for mechanical damage, corrosion or alterations caused by environmental factors). Check intervals and scope must at least comply with national standards and directives in force from time to time.

WARNING

Position the welding machine so as to allow the free circulation of air inside and, as much as possible, prevent metal or other dusts from entering.

The machine must be installed by professional personnel. All connections must be carried out according to current regulations, and in full compliance with safety laws in the country where the device is used.
Carefully read the “Mains connection” section in General Warnings code 3301151.

WARNING

The installation and management of this system must comply with the CEI EN 60974-9 standard.
Make sure that the mains voltage matches the voltage indicated on the specifications plate of the power source.
Connect a plug of adequate capacity for the current consumption **I1** indicated on the data plate.
Make sure that the yellow/green conductor of the power cable is connected to the plug’s earth contact.
The capacity of the overload cut-out switch or fuses, positioned between the power supply network and the power source, must be adequate for current I1 consumed by the power source.

DANGER

It is essential to use the device only if connected to a power supply with an earth conductor.
Using the device connected to the mains without an earth conductor or to a socket without a contact for this conductor constitutes very serious negligence.
The manufacturer declines all responsibility for damage to people or property resulting from incorrect connection to the mains.
The user is bound to have the efficiency of the earth conductor of the system and the device in use periodically checked by a qualified electrician.

For this power source, fix the rear wheels after fitting the axle beforehand (see fig. 1).

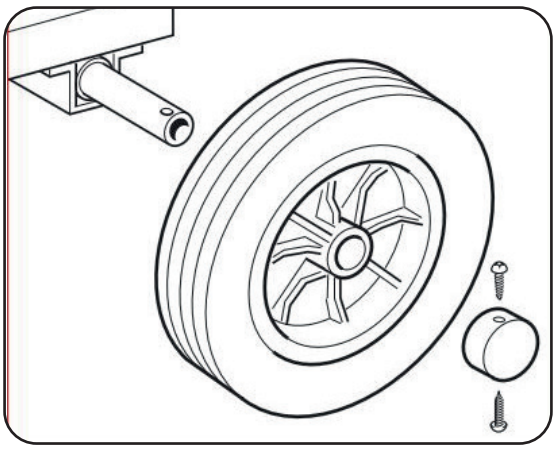


Fig. 1

- Fit the male support to the wire feeder and the female support to the power source (see fig. 2). The small wheels must be mounted on the wire feeder base, together with the torch support (see fig. 2). The assembled wire feeder must be positioned on the power source support.

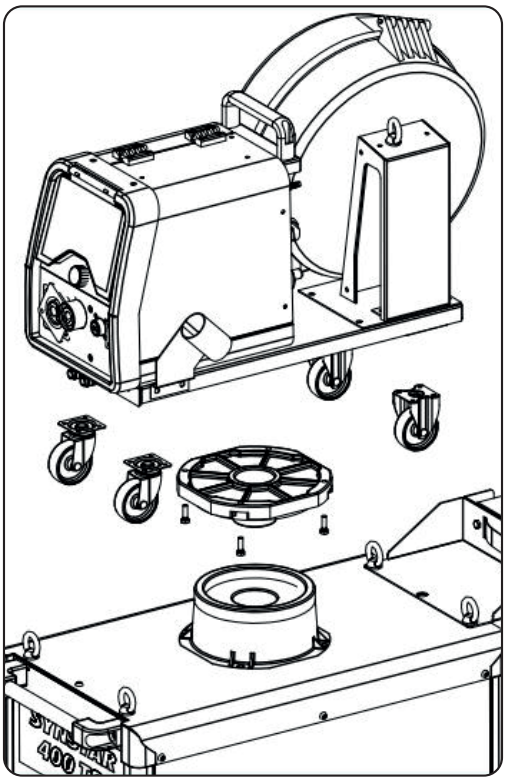


Fig. 2.

- Block one end of connection BA, by fixing the tab BB to the bottom of the machine (see fig. 3).

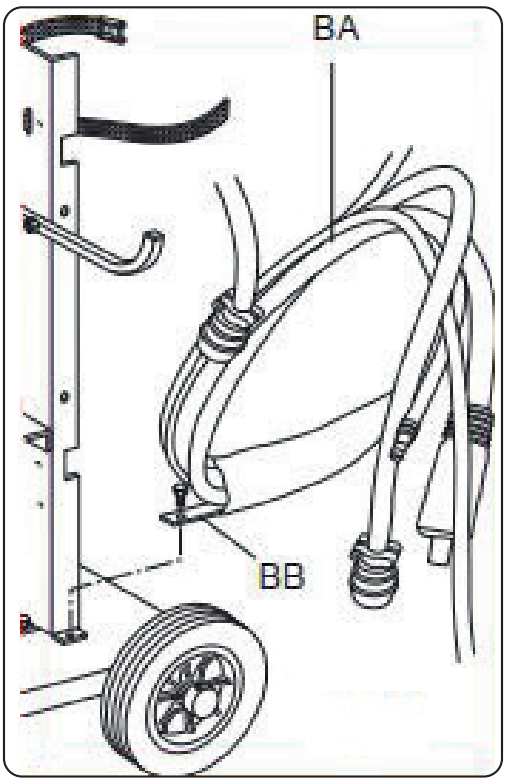


Fig. 3

- Connect all wiring on the back of the power source (see fig. 4).

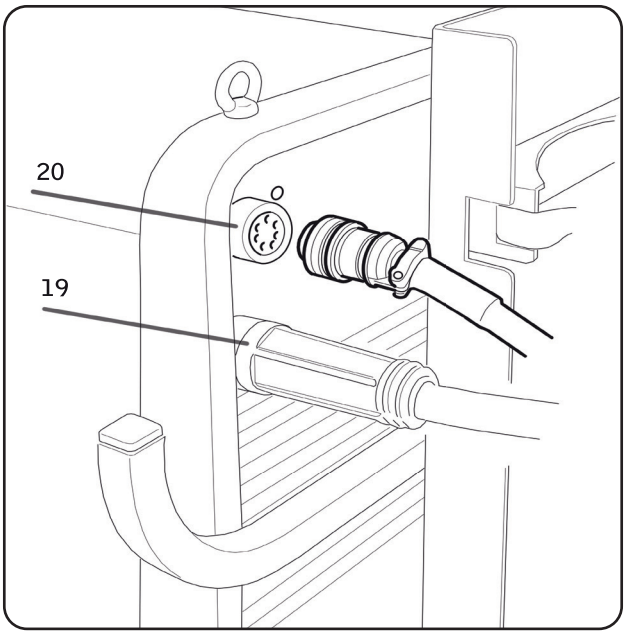


Fig. 4

- Avoid coiling the connection to minimise inductive effects that could affect welding. Connect the other end of connection BA to the wire feeder (see fig. 5).

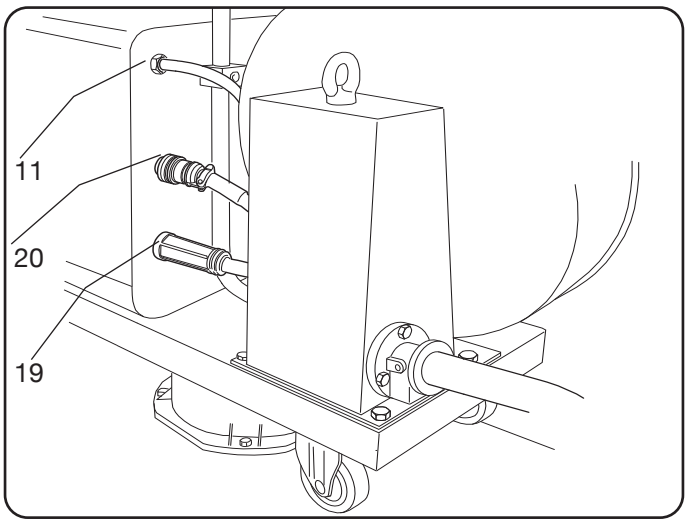


Fig. 5

- The coolant fluid hoses must be connected to the quick-fitting valves located below the base of the wire feeder (see fig. 6), by observing the colour coding on the trolley front side.

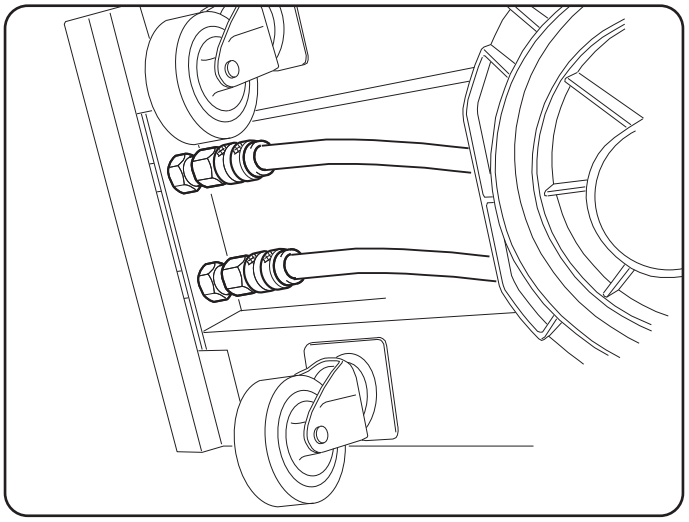


Fig. 6

Note on gas connection
Carefully read the sections “Explosions”, “Hazardous gases and vapours” and “Gas cylinders” in General Warnings code 3301151.

DANGER

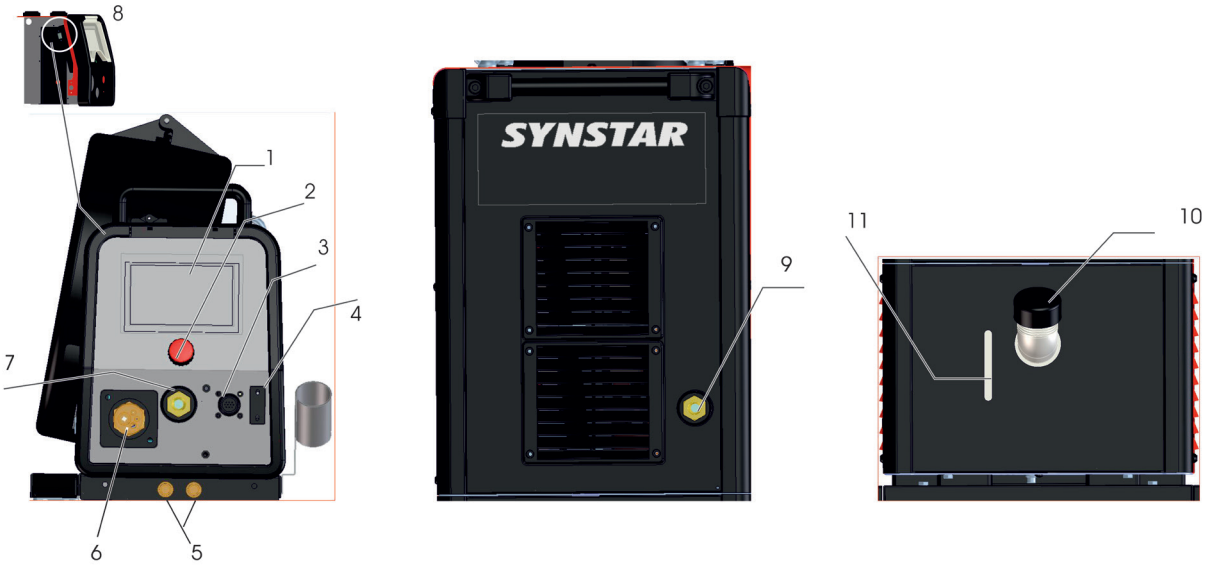
All cylinders and pressure regulators used in welding operations should be handled with care. If the gas cylinder is not connected, leave the valve protection in place. Always use gas cylinders suited to various types of application as well as appropriate accessories (pressure/flow regulators, pipes, fittings, etc.). Only use gas cylinders and accessories in good condition. If a gas cylinder valve is open, move your face away from the point where the gas emerges. When you have finished welding or cutting, close the valve of the gas cylinder used. Make sure no inert gas is leaking from the cylinders. Inert gas is colourless and odourless. An environment saturated with inert gas is devoid of oxygen, which causes asphyxiation of people in the environment.

- Position the cylinder on the support and fix it with the 2 straps; ensure that the straps are secured tightly to the cylinder to prevent dangerous tilting.
- Connect the gas hose to the outlet of the pressure regulator.
- Open the side door of the wire feeder.
- Connect the earth cable to socket **9** and through the terminal to the workpiece.
- Fit the wire coil on the support. The coil must be fitted so that the wire unwinds in an anticlockwise direction.
- Make sure the drive roller is correctly positioned according to the diameter and type of wire used.
- Cut the welding wire with a well-sharpened tool, keeping it between your fingers so that it cannot unwind, insert it inside the pipe exiting from the gear motor and, with the aid of a finger, insert it inside the steel tube until it emerges from the adapter.
- Fit the welding torch.
- After fitting the coil and torch, switch on the machine, select the appropriate synergic curve, following the instructions given in the “DESCRIPTION OF FUNCTIONS” section. Remove the gas nozzle and unscrew the torch contact tip. Press the torch trigger until the wire emerges. **BE CAREFUL to keep your face away from the end lance while the wire is emerging**, tighten the contact tip and fit the gas nozzle.

Open the canister adapter and adjust the gas flow to 10 – 12 l/min.

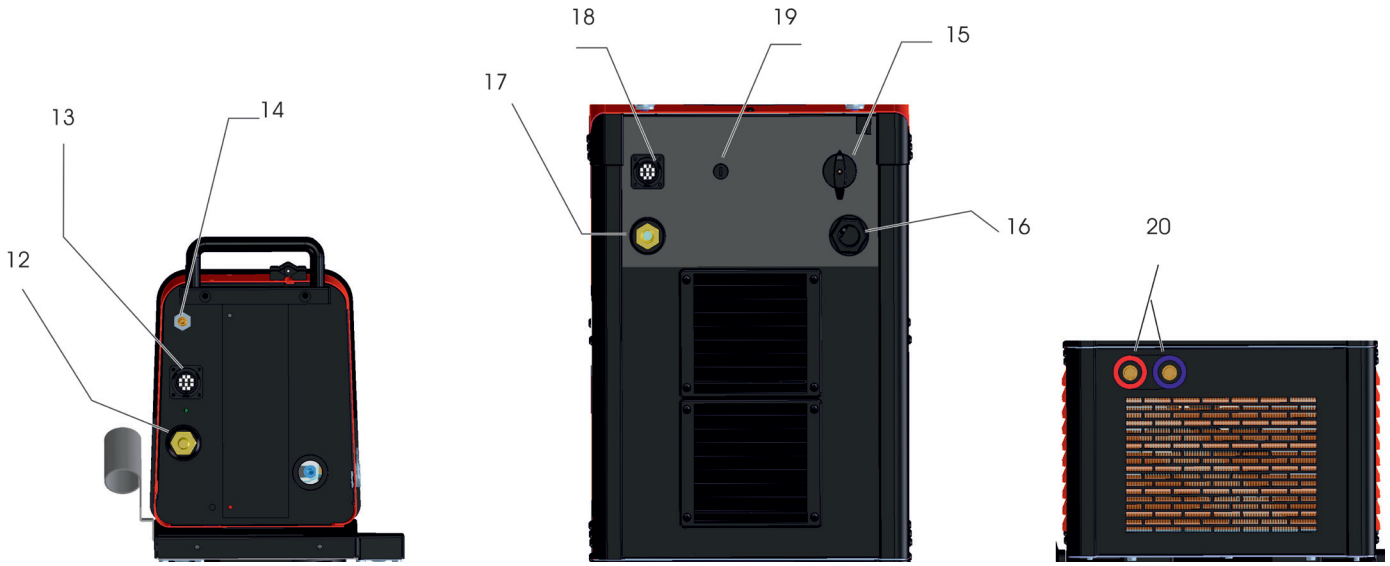
6 DESCRIPTION OF THE DEVICE

6.1 Front view



1	**DISPLAY** Touch screen for displaying welding parameters
2	**KNOB** For selecting and adjusting welding parameters
3	**CONNECTOR** For connecting MIG torch controls
4	**CONNECTOR** DB9 type (RS 232) connector to be used for updating the welding programs
5	**QUICK-FITTING VALVES** Connect the red and blue hose of the welding torch (red with red, blue with blue)
6	**CENTRAL ADAPTER** For connection to the MIG welding torch
7	**SOCKET** Socket for connecting the electrode clamp in MMA welding
8	**CONNECTOR** USB-type connector to be used for updating the welding programs
9	**EARTH CABLE OR SOCKET** Socket (-) for connecting the earth cable connector
10	**TANK CAP**
11	**SLOT** Slot to inspect the coolant fluid level

6.2 Rear view



12 **PLUG**
Plug for connecting the power cable floating connector of the power source-wire feeder extension

13 **PLUG**
Socket for connecting the services cable floating connector of the power source-wire feeder connection

14 **GAS FITTING**

15 **SWITCH**
Starts and stops the machine

16 **MAINS CABLE**

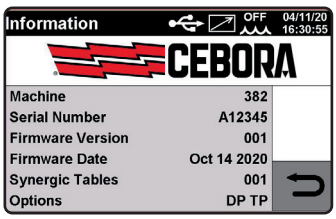
17 **SOCKET**
Socket (+) for connecting the power cable floating connector of the power source-wire feeder extension

18 **SOCKET**
Socket for connecting the services cable floating connector of the power source-wire feeder connection

19 **FUSE HOLDER**

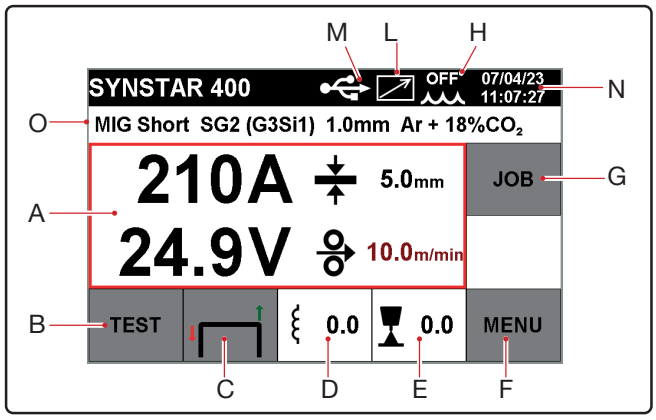
20 **QUICK-FITTING VALVES**
Connect the red and blue pipes of connection Item No 2069, which joins the power source to the wire feeder

7 DESCRIPTION OF TOUCH SCREEN DISPLAY FUNCTIONS



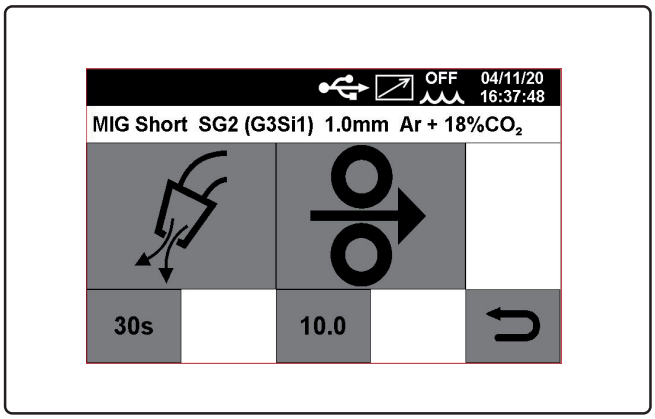
When the machine is switched on, for a few moments the display screen shows: the machine item number, the serial number, the firmware version, the firmware development date and the release number of the synergic curve table and power source options.
This information is also given in menu ⓘ.

7.1 MIG Process. Main screen



Pushbutton A The screen displays the welding current in amps, welding voltage in volts, the suggested thickness in mm and the welding wire speed in m/min. During welding the display shows continuous current and voltage values and, once welding is completed, the last value in amps and volts is displayed together with the message HOLD. When the display shows the HOLD parameters, they are BLUE. When in HOLD mode, press the middle of the display to open a screen showing the main parameters of the latest welding job: arc on time in seconds, main current time in seconds, average current in amps, average voltage in volts and total energy in Kj.
Amp and volt parameters are synergically adjusted by means of knob **2.**

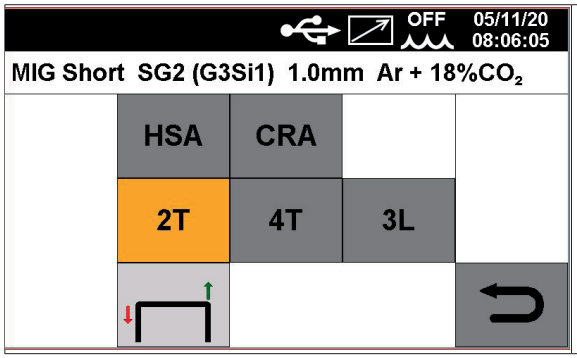
7.1.1 TEST mode



Pushbutton B To carry out the gas test and the wire test select pushbutton B.
When you press the pushbutton (test gas), gas emerges from the welding torch for a time period that is adjusted by means of key 30S; the value is adjusted between 1 and 60 seconds by means of knob **2**.
To stop gas release, press the pushbutton again.
Press pushbutton (wire test) and the wire will emerge from the torch at a rate that can be adjusted by selecting pushbutton 10.0 and adjusting the value by means of knob 2, from 1 to 22 metres/minute (item no 379) 25 metres/minute (item no 382-383), the pushbutton must be held down throughout the test.
To return to the previous menu, press the pushbutton

7.1.2 Start mode

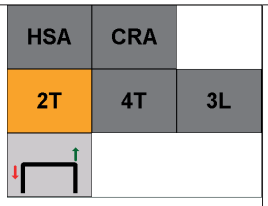
To choose the start mode, select pushbutton **C**
Start modes are the same for all MIG/MAG processes



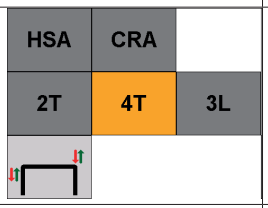
Set the desired start mode using the appropriate pushbuttons. When start mode has been selected, the associated section turns orange.

START pushbutton pressed
START pushbutton released

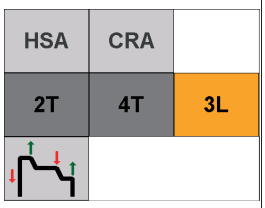
The **START** command for manual applications is available in the wire feeder, either on the torch adapter - it can be activated using the corresponding pushbutton on the torch - or on the remote control connector.



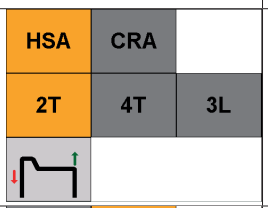
2 stroke mode
Mode appropriate for short welding bursts.
Welding is started by pressing the **START** pushbutton and ends when the pushbutton is released.
HSA and **CRA functions can be activated in 2 stroke mode.**



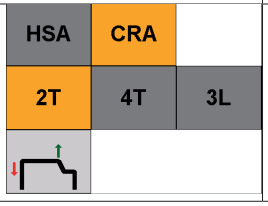
Automatic mode or 4 stroke mode
Appropriate mode and perform long-term welding. Starting and stopping are controlled by pressing and releasing the torch **START** pushbutton.
HSA and **CRA functions can be activated in 4 stroke mode.**



3 level mode
When the arc strikes, the current is set to the first level. As long as the **START** pushbutton is held down, the current remains on the first level. Upon releasing the **START** pushbutton, the current passes from first to second level within the slope time; once the second level is reached, this is maintained. The next time the **START** pushbutton is pressed, the welding current will be adjusted to the 3rd level within the set slope time. When the **START** pushbutton is released welding stops and the post-flow procedure is run. The **HSA** and **CRA** functions are inhibited in 3-level mode.



HSA mode
By activating **HSA** mode, the operator can adjust the first current level, the time spent at the first current level and the first level ramp time at the final welding current.
When the **START** command is activated, the set values are automatically carried out.

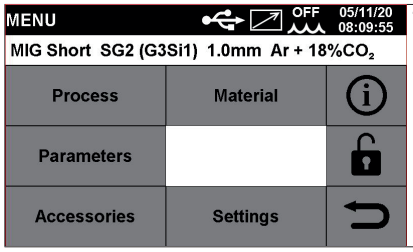


CRA mode
By activating **CRA** mode, the operator can adjust the final current level (crater current), the time spent at final current level and the time of the ramp down from the welding current to the final current. When the **START** command is deactivated, the set values are automatically carried out.

7.1.3 Setting welding parameters

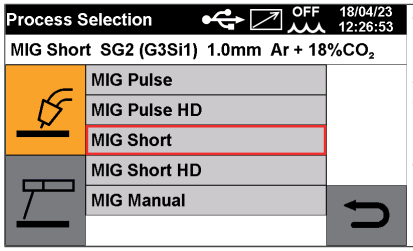
0.0	**Adjusting inductance.** This can be selected using pushbutton **D**. This function can be used to switch between a narrow, hard arc with deep penetration (negative values) and a broad, smooth arc (positive values). The adjustment can range between +/- 9.9, 0 is the factory setting**.**
0.0	**Adjusting arc length.** This can be selected using key **E**. If necessary, arc length (welding voltage) can be corrected by +/- 9.9 V for the specific welding job, 0 is the factory setting.

7.2 Main menu



This can be selected using pushbutton **F**
Select to enter the **Main Menu.**

7.2.1 Selecting the welding process



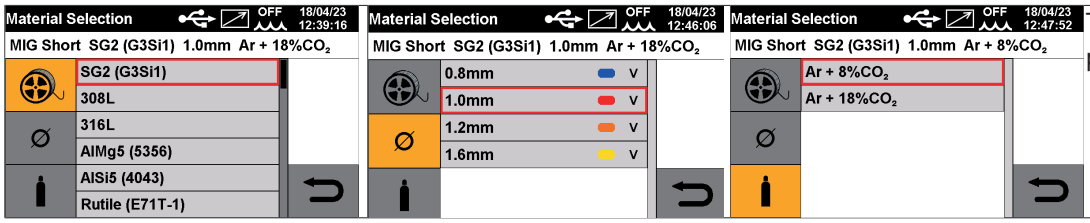
The **PROCESS** pushbutton can be used to select the **MIG/MAG or MMA** process.

After selecting the **MIG** welding process, with knob 2 you can select the arc transfer type: **MIG Pulse, MIG Pulse HD**, **MIG Short, MIG Short HD and MIG Manual**.

To confirm the selection, press knob **2** or key .

7.2.2 Selecting wire type, diameter and welding gas

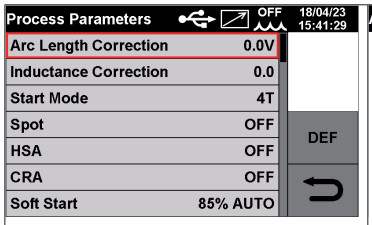
The **MATERIAL** pushbutton can be used to select wire type, diameter and welding gas

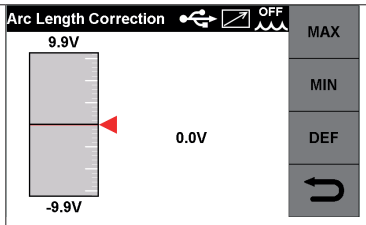


To confirm the selection, press knob **2** or key

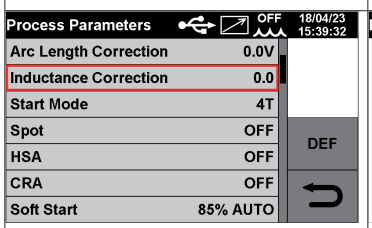
7.2.3 Selecting process parameters

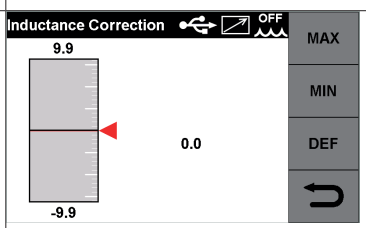
The **Parameters** pushbutton can be used to set the various process parameters:



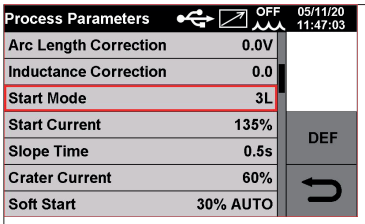


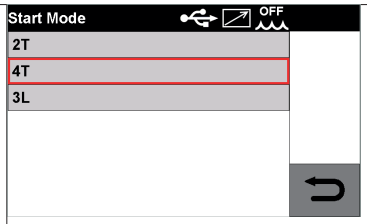
■ **Arc length correction**
This can be selected using pushbutton **E**
Turn knob **2** to select the parameter and confirm the selection by pressing the same knob.
Adjust the value by turning knob **2**.
To confirm the selection, press knob **2** or key .
Press the **DEF** key to restore factory settings.





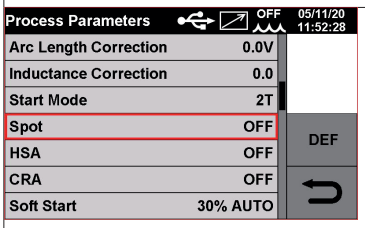
■ **Inductance correction**
This can be selected using pushbutton **D**
Turn knob **2** to select the parameter and confirm the selection by pressing the knob.
Adjust the value by turning knob **2**.
To confirm the selection, press knob **2** or key .
Press the **DEF** key to restore factory settings.

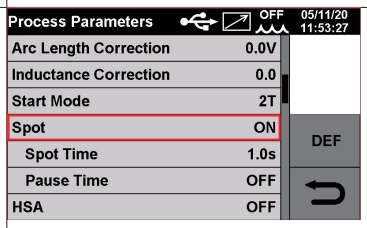


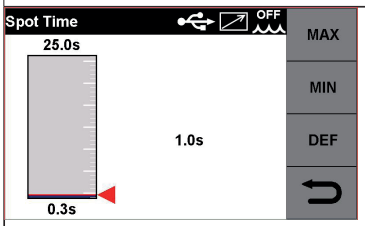


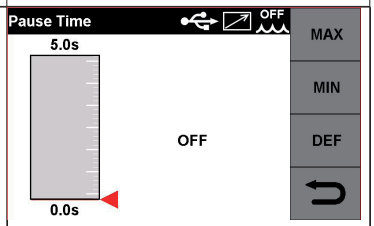
■ Start mode

This can be selected using pushbutton **C**
The selection is between **Mode 2T, Mode 4T and Mode 3L.**
Turn knob **2** to select the parameter and confirm the selection by pressing the knob. To select mode, turn knob **2**. To confirm the selection, press knob **2** or key ⮌ .



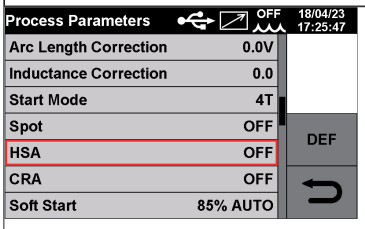


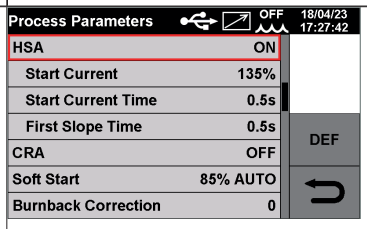




■ SPOT mode

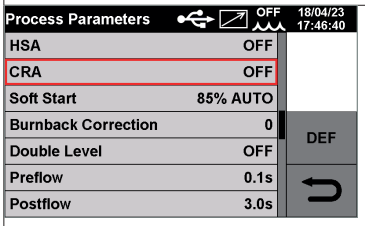
The operator can choose between **Spot time and pause time** function.
This function is blocked when function **3L** is activated.
If you select **Spot time ON**, the screen displays the function **Spot time**. While selecting it you can adjust it by means of the adjustment bar.
In addition to **Spot time**, the display shows the **Pause time**. When this is selected, use the adjustment bar to regulate the pause time between one welding spot or section and another. Turn knob 2 to select the parameter and confirm the selection by pressing the same knob. Adjust the value by turning knob **2**. To confirm the selection, press knob 2 or key ⮌ Press the DEF key to restore factory settings.

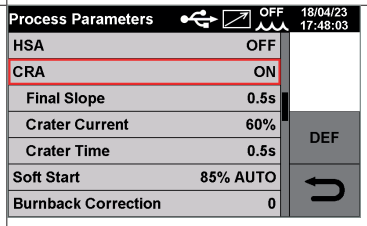




■ HSA mode

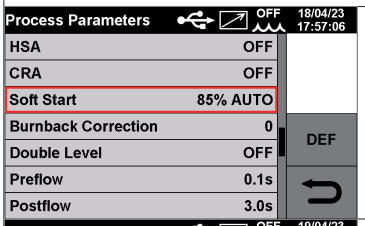
Turn knob **2** to select the parameter and confirm the selection by pressing the knob. If you select **HSA ON** the screen displays the Start current, Current time and Connection time. To adjust these parameters see chapter on **Start Mode**.
Press the DEF key to restore factory settings.

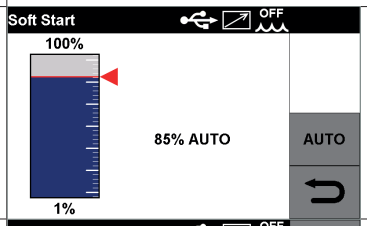




■ CRA mode

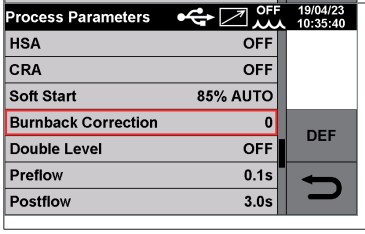
Turn knob **2** to select the parameter and confirm the selection by pressing the knob. If you select **CRA ON** the screen displays the **Connection time**, **Crater filling current** and **Crater filling time**. To adjust these parameters see chapter on **Start Mode**.
Press the DEF key to restore factory settings.

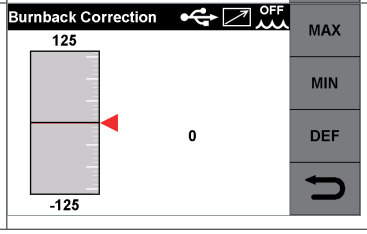




■ Soft Start mode

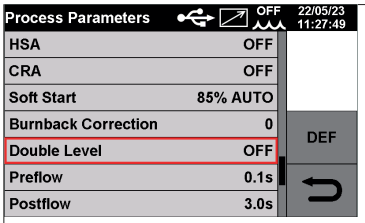
Adjustment ranges from 0 to 100%. This is the wire speed expressed as a percentage of the speed set for welding, before the wire touches the workpiece to be welded. This adjustment is important to always obtain good starts. Press **AUTO** to call up the factory settings.





■ Burnback mode

The adjustment can vary from -125 to +125 ms. Its purpose is to adjust the length of wire emerging from the gas nozzle after welding. A positive figure means more wire has been burnt and the amount sticking out is shorter. Press 0 to call up the factory settings.
Press the DEF key to restore factory settings.

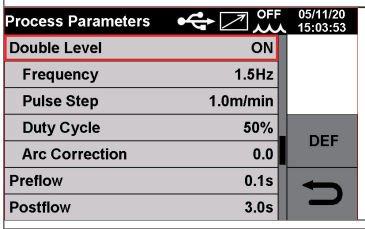


■ **Double level mode**

Active in synergic MIG/MAG processes only. This mode involves changing wire speed (and consequently also current intensity) between two levels. Before setting double-level welding, weld a short bead to determine the wire speed and thus the current to obtain the optimum bead penetration and width for the type of weld required.

In this way the wire feed speed is determined; the set SPEED DIFFERENCE parameter will be added to or subtracted from this value.

Before start working you should not forget that for a correct bead, the minimum overlap between one mesh and another must be 50%.



	MIN	MAX	DEF
Frequency	0.1 Hz	5.0 Hz	1.5 Hz
Speed difference	0.1 m/min	3.0 m/min	1.0 m/min
Working cycle	25%	75%	50%
Arc correction	-9.9	9.9	0.0

■ **Double level frequency**

Frequency is the number of periods per second expressed in Hz. Period means the duration of a complete speed high-low variation cycle.

■ **Speed difference**

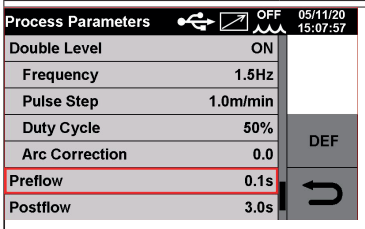
Duration of the high speed/current in relation to the overall period duration.

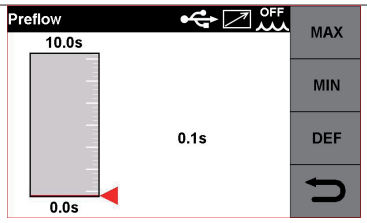
■ **Duty cycle**

Duration of the high speed/current in relation to the overall period duration.

■ **Arc correction**

Sets higher speed/current arc length

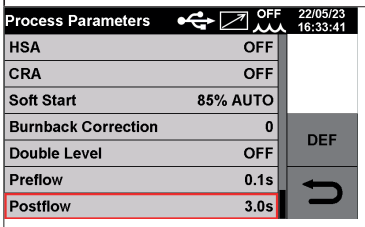


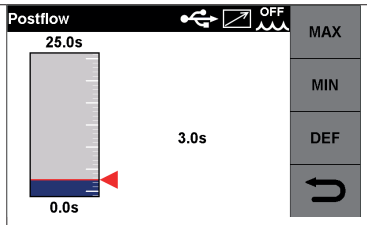


■ **Preflow**

Adjustment ranges from 0 to 10 seconds. Turn knob **2** to select the parameter, then press to confirm. Turn knob **2** to change the value; to confirm press knob **2** or key ⮌ .

Press the DEF key to restore factory settings.





■ **Postflow**

Adjustment ranges from 0 to 25 seconds. Turn knob **2** to select the parameter, then press to confirm. Turn knob **2** to change the value; to confirm press knob **2** or key ⮌ .

Press the DEF key to restore factory settings.

7.3 Accessories menu

Activate the various accessories available in the power source from the following menu.

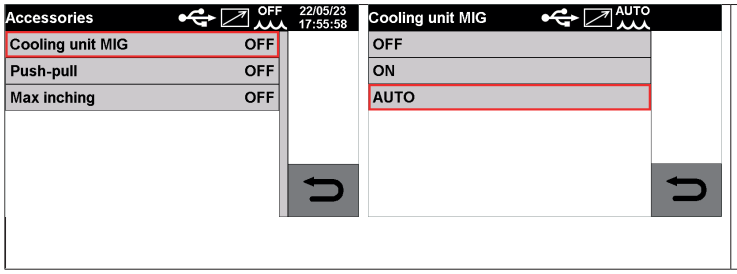
WARNING

If accessories are present in the welding system, they must be connected to the power source before powering up. Connecting/disconnecting accessories while the power source is switched on leads to system malfunctions and under extreme circumstances could compromise the integrity of the welding system. CEBORA SpA does not provide warranty coverage for inappropriate use of the welding system.

To access the Accessories menu, select ***Menu->Accessories***

7.3.1 Cooling unit

The cooling unit to be used with the SYNSTAR power sources is Item No. 1686 - GRV22.
On power source Item No 379 it is optional, but standard on power sources Item No 382 and 383.
The status bar always shows the cooling unit icon **H** and unit status is shown in the upper part of the icon: OFF, ON, AUTO 



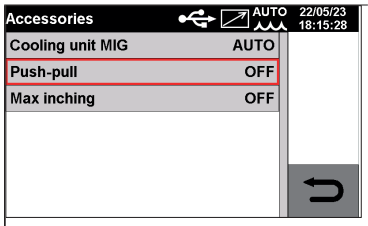
Knob **2** is used to select/activate the operating mode:

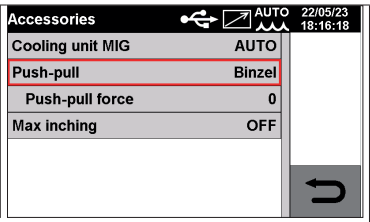
OFF Cooling unit disabled
ON Cooling unit always on
AUTO Cooling unit operates in synchrony with the welding process

For correct connection of the cooling unit Item No 1686 to the power source, consult instruction manual code 3301297.

Coolant requirements
The power source is supplied with a minimum quantity of coolant fluid: the customer is responsible for filling the tank before the system is used.
Use only Cebora coolant (Item No 1514) and read the MSDS carefully to ensure its safe use and correct conservation.
The 5 litre capacity tank inlet is located to the front of the power source. Fill up to max level and top up to make up the volume of fluid in the pipes after the first system start-up.
NOTE: small fluid leaks will occur during use of the system and particularly when changing the torch or consumables. Top up weekly to max level.
NOTE: after 6 months, the coolant must be changed completely, regardless of how many hours of work the system has completed.

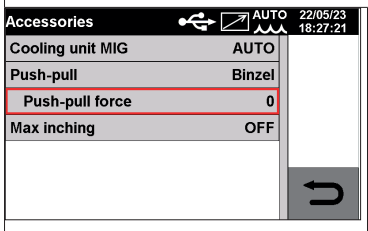
7.3.2 Push-pull torch

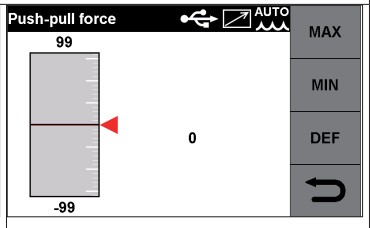




Use knob **2** to select **Push-Pull** mode:

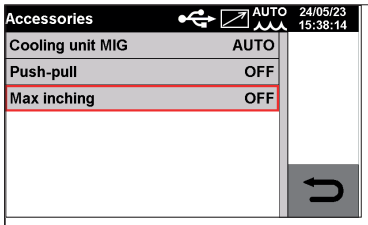
Binzel torch; for Item No 382 and 383: connect a Binzel torch with 42 VDC motor to the wire feeder; for Item No 379: connect a Binzel torch with a 24 VDC motor. The machine is ready to weld. Both wire feed motors, the main and the Push-Pull motor, are already synchronised.

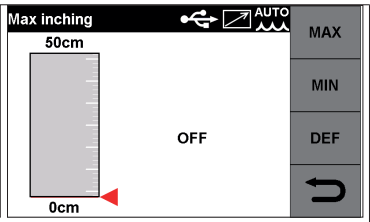




Use knob **2** to select **Push-Pull Force** mode.
This function adjusts the drive torque of the Push-Pull motor in order to make the wire feed linear. The adjustment can vary from -99 to +99.
Adjust the value by turning knob 2. Confirm the choice by pressing knob 2 or key ⮌
Press the DEF key to restore factory settings.

7.3.3 Max Inching



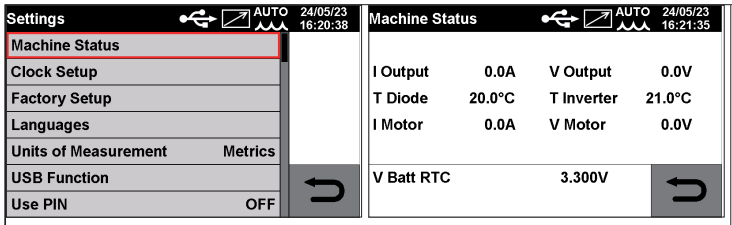


Use knob **2** to select **Max Inching mode.**
The purpose is to stop the welding machine if the wire emerges for the preset length in cm after starting with no passage of current. Adjustment OFF - 50 cm.
Use knob 2 to set the desired value. Press to confirm, or press the key ⮌.
Press the DEF key to restore factory settings.

7.4 Settings menu

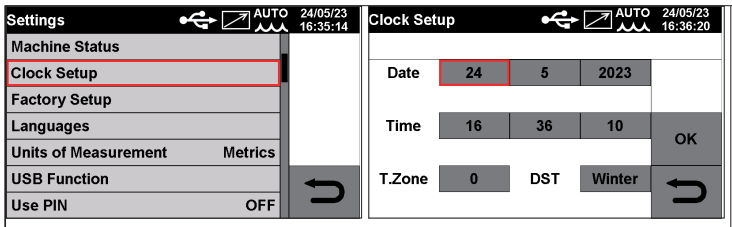
This menu is used for the welding power source basic settings

7.4.1 Machine status



Use knob **2** to select **Machine status** mode.
The power source status menu displays information about power source output voltage and current, power source internal temperatures, motor voltage and current, battery voltage.

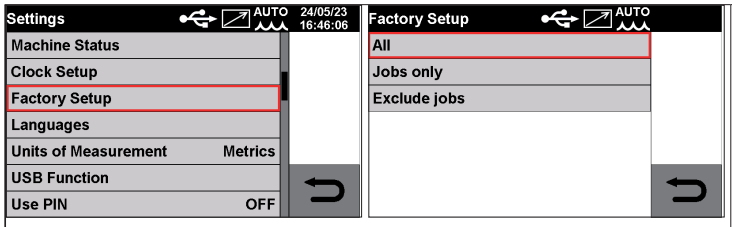
7.4.2 Date and Time Setting



Use knob **2** to select **Clock Setup** mode.
Adjust values by turning knob **2** and confirm by pressing.

To confirm date and time press the key OK
To exit press the key ⮌

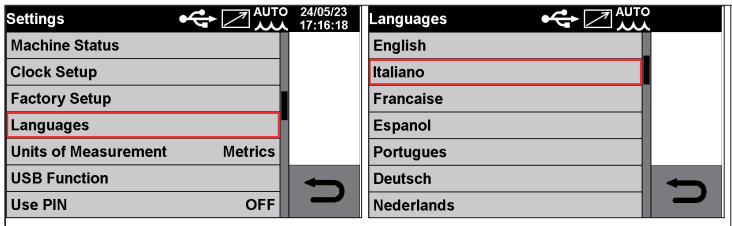
7.4.3 Resetting factory settings



Use knob **2** to select **Factory Setup mode**.
This function resets the factory preset values.

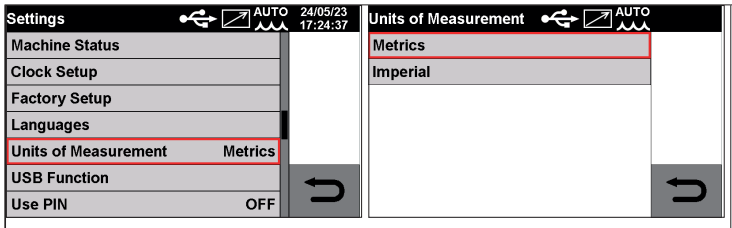
All	Restore all jobs and settings
Jobs only	Resets only stored "Job" working programs.
Exclude jobs	Resets all but saved "Job" working programs.

7.4.4 Language setting



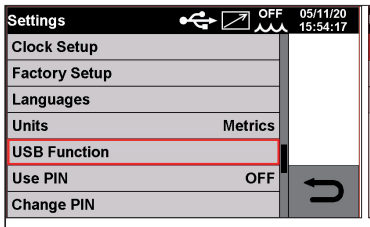
Use knob **2** to select **Languages** mode.
To confirm the language simply hold down knob **2**
To exit press the key ⮌

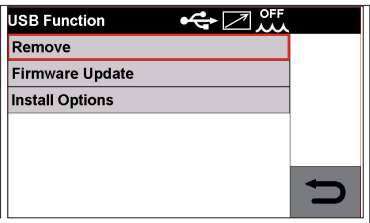
7.4.5 Setting measurement unit



Use knob **2** to select **Units of measurement** mode.
Select the unit of measure, metric or imperial.

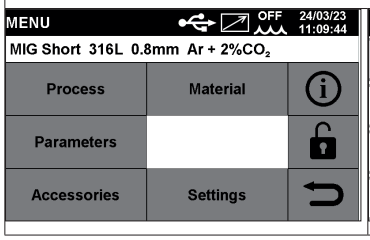
7.4.6 USB Port Management

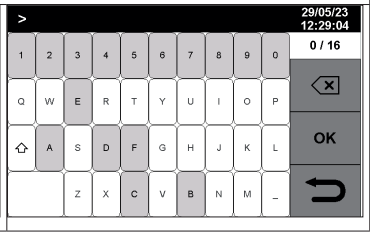




Use knob **2** to select **USB Function** mode.
When a USB pen drive is inserted into a USB port, the status bar shows the icon

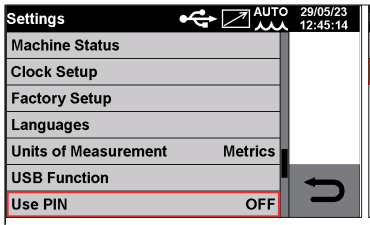
Remove Select this item to remove the USB pen drive.
Firmware Update Select this item to update the power source firmware. Create a directory named "Bin" on the USB pen drive. Upload the .psu file to the "Bin" directory. Insert the pen drive into the power source USB port.
Install Options Select this item to install the software options in the power source. The option release file loaded on the USB drive must have the extension .txt and is supplied by Cebora after purchasing the option. Insert the pen drive into the power source USB port.

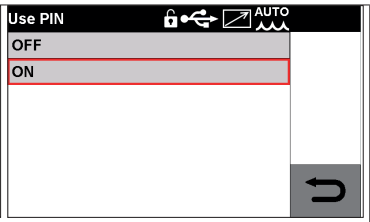




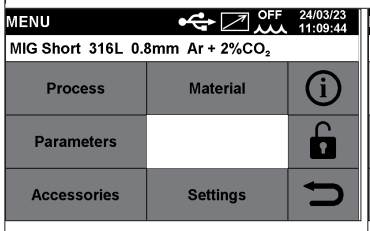
Installation can also be carried out using the keypad.
Use the **F** key to enter the **Main menu**, press the key and then press the key.
Using the alphanumeric keypad enter the unlock code, then press **OK**.

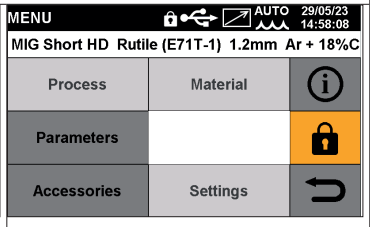
7.4.7 Use PIN





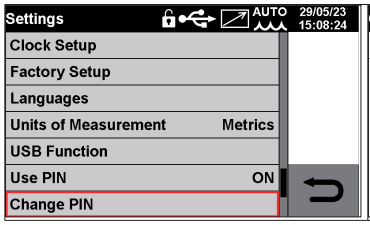
Use knob **2** to select **Use PIN** mode.
A lock code can be used to stop the use of PROCESSES, MATERIALS and PARAMETERS.

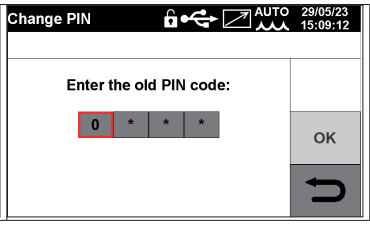




Once **Use PIN** has been set to **ON**, press the padlock key to lock the PROCESSES, MATERIALS and SETTINGS selections; the padlock key will be closed and yellow.
To unlock the PROCESSES, MATERIALS and SETTINGS selections, it will be necessary to enter the PIN. **Default PIN 0000**

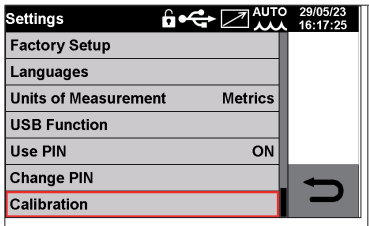
7.4.8 Change PIN





Use knob **2** to select **Change PIN** mode.
A lock code can be used to stop the use of PROCESSES, MATERIALS and PARAMETERS. **Default PIN 0000**

7.4.9 Calibration



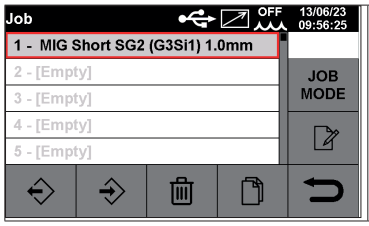
Use knob **2** to select **Calibration** mode.
The purpose of this function is to provide specialised personnel with guidance on how to calibrate Cebora power sources in compliance with IEC EN 60974 -14.
The power source calibration must be carried out by qualified personnel.
For instructions, contact **Cebora Technical Assistance Service**.

7.5 Job Menu

A welding programme and its parameters (process, ignition, mode etc.) can be saved on the JOB page.
The available JOBS are numbered and range from 1 to 99.
The operations that can be carried out on a JOB are listed below:

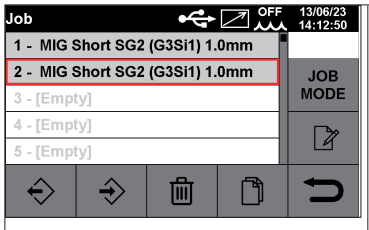
	Save the Job
	Retrieve the Job
	Delete the Job
	Copy the Job
	Rename the Job

7.5.1 Saving a welding JOB



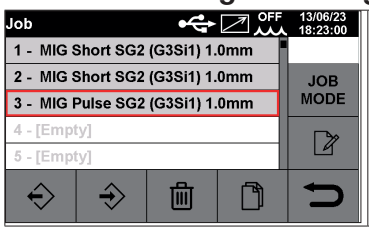
Using knob **2**, select the JOB memory position.
Press the  key to save the Job
A description of the saved process will now appear in the selected position.

7.5.2 Modifying a welding JOB



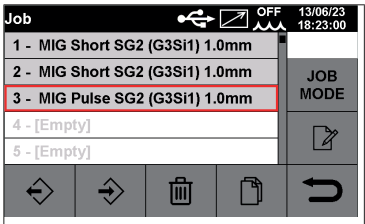
Select the relevant JOB by turning knob **2**
Retrieve by pressing pushbutton  .
Modify the welding parameters.
Select **JOB** using the **G** pushbutton
Overwrite the previous JOB or create a new one by selecting a free memory position and pressing 

7.5.3 Deleting a welding JOB



Select the JOB memory position by turning knob **2**
Press pushbutton  and the JOB will be deleted.

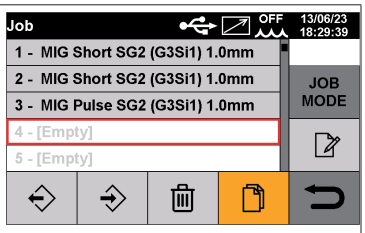
7.5.4 Copying a welding JOB



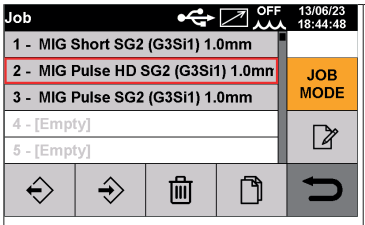
Select the memory position of the JOB to be copied by turning knob **2**

Press pushbutton  and the JOB will be copied to the memory.

Select a free memory position using **2** and press  .
The JOB will be copied to the new position.

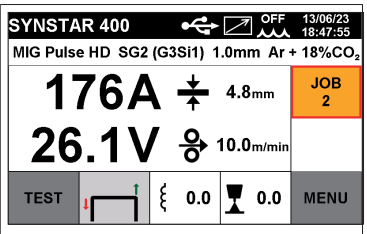


7.5.5 Welding with a JOB

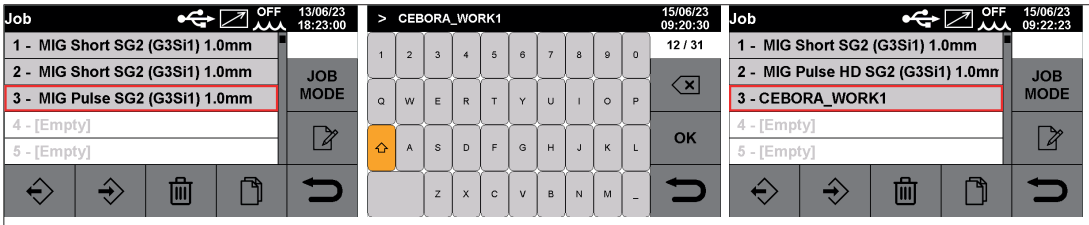


Select the memory position of the JOB to be used by turning knob **2**.
Press the Job Mode pushbutton to activate welding with the selected JOB

Press the pushbutton 
The **Job Mode** operating mode is active with the selected JOB (2 in the example).



7.5.6 Renaming the welding JOB



Select the JOB to be renamed by turning knob **2**.

Use the pushbutton  to invoke the keyboard.
Rename the JOB and press **OK** (e.g. **CEBORA_WORK1**)

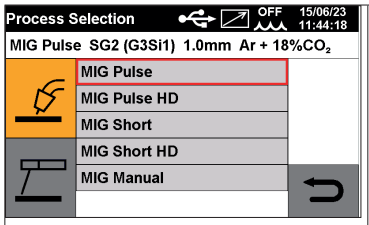
Set Job Mode and turn knob **2**, or the torch UP/DOWN pushbuttons to navigate between saved JOBS. A JOB can be selected when the machine is in standby or while it is delivering power. Switching between JOBS with the arc on is NOT allowed when they relate to different processes, e.g.:
- MIG -> MMA

8 MIG WELDING

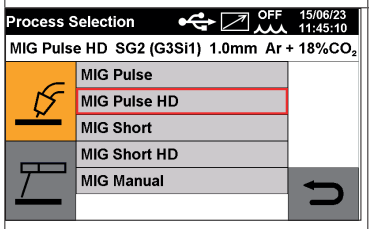
- Connect the earth cable to the socket 9 (-).
- Connect the cable connector of the power source-wire feeder connection to the rear socket 17.
- Connect the service connector of the power source-wire feeder connection to the rear connector 18.
- Connect the cable connector of the power source-wire feeder connection to the rear plug of wire feeder 12.
- Connect the service connector of the power source-wire feeder connection to the rear connector of wire feeder 13.
- Connect the gas hose emerging from the power source-wire feeder connection to the rear fitting of wire feeder.

8.1 Description of the welding process

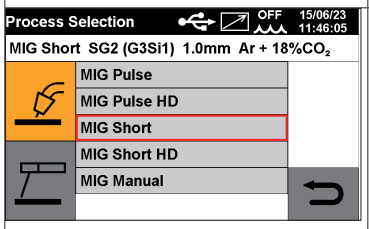
In the Main Menu, after selecting process, choose welding type **MIG**: **Mig Pulse, Mig PulseHD, Mig Short, Mig ShortHD or Mig Manual**
For all the processes indicated below (except for MIG Manual), the welding parameters are adjusted synergically using knob **2**. Individual processes are available only for the individual synergic curves for which they have been developed or which are allowed by the process.
Select the wire type, diameter and gas; make this selection in the **Main Menu**, by means of the **process** and **material** keys.



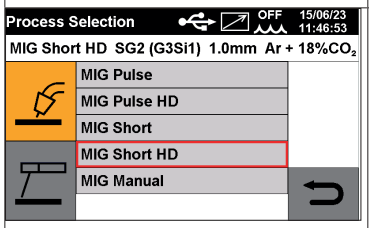
MIG Pulse
When this welding process is selected, the filler material is transferred via a controlled energy pulsed waveform to achieve constant detachment of molten material droplets that are transferred to the workpiece without spatter. The result is a strip of molten welding material that joins any material thickness or type effectively, with no spatter on the workpiece.



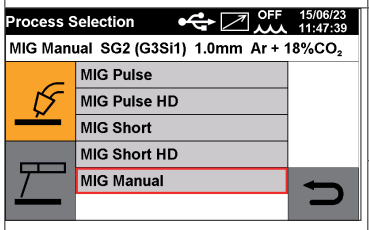
MIG Pulse HD
Select this process to weld at a faster wire feed rate than with the pulsed process. More wire is deposited for the same current setting.

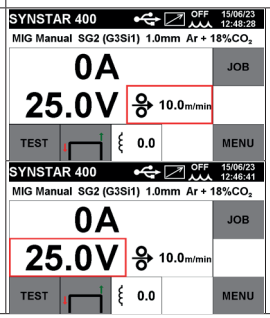


MIG Short
When this process is selected, the material can be transferred in different ways: Short Arc, Globular, Spray Arc and it depends on the ratio between wire speed and set welding voltage.
The **E pushbutton can be used to adjust arc length (welding voltage) by +/- 9.9 V using knob 2.**



MIG Short HD
MIG Short HD process offers the option of increasing wire speed for the same welding voltage. Set the desired voltage and current value, using pushbutton **E** change m/min in terms of percentage by adjusting knob **2**. The m/min correction is indicated on the display as a percentage and as an absolute value.





MIG Manual
After selecting MIG Manual, select the type of wire, diameter and gas from the main menu. Select the m/min and set the motor speed; select the welding voltage, then press knob 2 for longer than one second. The voltage for the m/min set will be shown on the display. Now the m/min can be increased without changing the voltage.

9 MMA DC WELDING

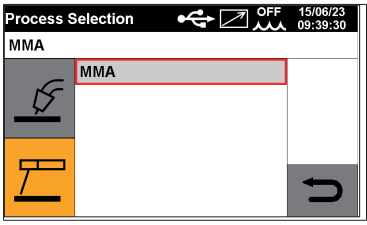
SYNSTAR range power sources are able to manage the MMA process in DC mode. This welding machine is suitable for welding all types of electrodes, with the exception of cellulosic (AWS 6010).

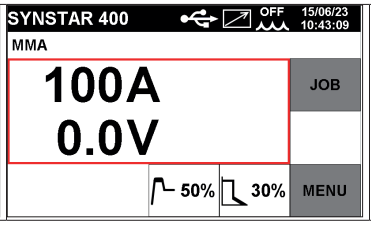
- Make sure that the Power On switch is in position 0 (OFF), then connect the welding cables, respecting the polarity required by the manufacturer of the electrodes that you will be using and the terminal of the earth cable to the workpiece is at the closest point to the weld, ensuring that the electrical contact is good.
- Do not touch the torch or the electrode holder and the earth clamp simultaneously.
- Turn on the machine using the Power On switch.
- Select MMA process.
- Adjust the current based on the electrode diameter, welding position and type of weld to be made. After welding, always switch off the power source by removing the electrode from the electrode holder.

WARNING

Beware of electrical shocks.
When the main switch is in ON position, the electrode and the non-insulated part of the electrode holder are live. Therefore, make sure that the electrode and the non-insulated part of the electrode holder do not come into contact with electrically conductive or earthed persons or components (e.g. outer casing, etc.).

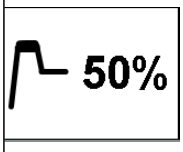
9.1.1 MMA DC Process



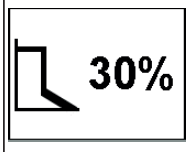


Use the **F** pushbutton to enter the main menu.
Enter the **Process Selection**
Select the **MMA** process
The screen displays the welding current in **A**mperes and the welding voltage in **V**olts.

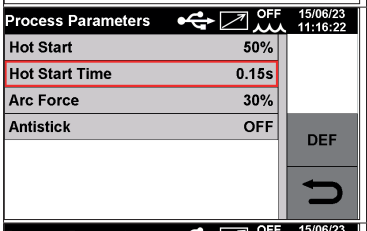
9.1.2 MMA process parameters

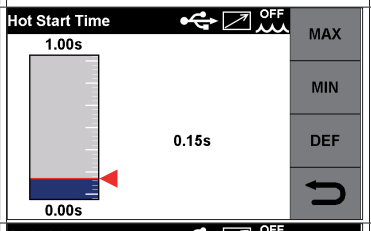


Hot Start
This is the overvoltage supplied when the arc is ignited. This is adjustable from 0 to 100% of the set welding current.
Improves ignition even when using electrodes with poor ignition properties

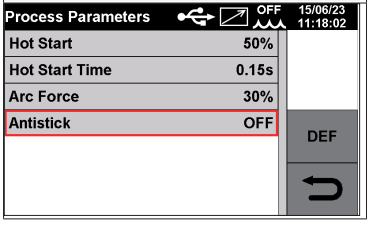


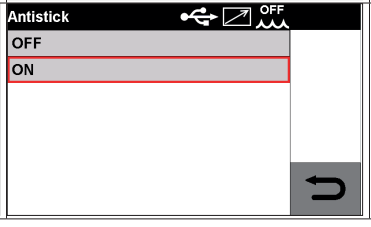
Arc Force
This regulates the dynamic characteristics of the arc. This is adjustable from 0 to 100% of the set welding current.
0 voltaic arc with little spatter, barely defined 100 voltaic arc with spatter, but stable





Hot start time
This is the overvoltage time supplied when the arc is struck. Adjustment ranges from 0 to 1 sec.
To be adjusted according to the diameter of the electrode to be welded.





Antistick
The Antistick function automatically turns off the welding power source when the electrode sticks to the material to be welded, allowing removal by hand without spoiling the electrode holder.

10 ERROR CODES

Error management is divided into two categories:
1) Hardware errors [E]. These cannot be reset and require the power source to be restarted. They are displayed on the screen with a red background.
2) Alarms [W] linked to an external condition that can be reset by the user and does not require the power source to be restarted.

These are displayed on the screen with an amber background.

Code	Type	Error Description	Action
2	[E]	EEPROM error detected by the power source internal board	Switch the power source off and on. If the problem persists, contact technical assistance
3	[E]	General fault error detected by the power source internal slave board	Switch the power source off and on. If the problem persists, contact technical assistance
6	[E]	Communication error detected by master panel board on CAN-bus	Switch the power source off and on. If the problem persists, contact technical assistance
9	[E]	Communication error between Slave board and Master board	Check connection between power source and wire feeder. Switch the power source on and off. If the error persists, contact technical assistance.
10	[E]	Power output nil (I=0A, V=0V)	Hardware error, contact technical assistance. Probable break in inverter circuit of primary winding or secondary unit
11	[E]	Overload at output	Hardware error, contact technical assistance.
14	[E]	Undervoltage error detected on inverter control board.	Check machine supply voltages. If the problem persists, contact technical assistance.
17	[E]	Invalid or unrecognised power source model.	Check the wire feeder - power source combination is correct. Switch the power source on and off. If the error persists, contact technical assistance.
20	[E]	Interlock signal absent	Switch the power source off and on. If the problem persists, contact technical assistance
22	[E]	Hardware key not readable	Switch the power source on and off. If the error persists, contact technical assistance.
24	[E]	Error during reprogramming of the EPLD or FPGA	Switch the power source off and on. If the problem persists, contact technical assistance
25	[E]	Excessive primary winding current error	Probable break in output diodes or primary winding inverter circuit. Switch the power source on and off. If the error persists, contact technical assistance.
26	[E]	Time not set or battery flat	Turn the power source off and on. Replace the battery on the panel board and contact technical assistance if the error persists.

Code	Type	Error Description	Action
27	[E]	Write error in the FLASH on the MASTER panel board	Switch the power source on and off. If the error persists, contact technical assistance.
30	[E]	Output current sensor offset reading problem	Switch the power source on and off. If the error persists, contact technical assistance.
42	[E]	Motor speed out of control.	Check there are no mechanical blockages in the wire feeder rollers. If the motor turns at an uncontrollable speed, check the wiring in the wire feeder and ensure the motor feed polarity is correct. If the error persists, contact technical assistance.
46	[E]	Push-pull board error	Check that the Push Pull kit, Item No 447 is correctly connected. Check the kit supply voltages. If the error persists, contact technical assistance
47	[E]	Low motor supply voltage error.	Check connection between power source and wire feeder. Switch the power source on and off. If the error persists, contact technical assistance.
53	[W]	Start button pressed during operating mode reset.	Release the torch trigger. If the error persists, contact technical assistance.
54	[E]	Current not zero when power source tested	Switch the power source on and off. If the error persists, contact technical assistance.
56	[E]	Excessive duration of short-circuit at output	Switch the power source on and off. If the error persists, contact technical assistance.
57	[E]	Excessive current on wire feeder motor.	Check there are no mechanical blockages in the wire feeder rollers. Switch the power source on and off. If the error persists, contact technical assistance.
58	[E]	Firmware upgrade error	Contact technical assistance or impose firmware update by turning DIP2 - switch4 on the master panel board ON.
60	[E]	Average current above maximum limit for too long.	This error arises when the welder delivers a current in excess of 15% of Imax for longer than 1.5 sec. Switch the power source on and off. If the error persists, contact technical assistance.
63	[E]	Incorrect mains voltage (no phase)	Check that the mains plug phases are properly connected. If the error persists, contact technical assistance.
73	[W]	Thermal protection triggered due to excessive temperature in secondary circuit.	Wait until the machine cools down. Check that the air intake and outlet grilles are not blocked. If the problem persists, contact technical assistance.
74	[W]	Thermal protection triggered due to excessive temperature in IGBT assembly.	Wait until the machine cools down. Check that the air intake and outlet grilles are not blocked. If the problem persists, contact technical assistance.

Code	Type	Error Description	Action
75	[W]	Coolant pressure too low.	Check the coolant level. Check the centrifugal pump turns correctly. If it does not turn correctly, release using a release screw. If the problem persists, contact technical assistance.
76	[W]	Cooling unit not connected	Check the pressure switch connection is intact. If the problem persists, contact technical assistance.
80	[W]	Wire feeder door open.	Check that the door of the wire feeder compartment door is properly closed. If the problem persists, contact technical assistance.
85	[W]	Error during USB firmware updating.	Make sure the USB key is correctly inserted. If the problem persists, contact technical assistance.
98	[W]	Arc does not strike within the timeout (inching timeout).	Check that the “Max Inching” function is correctly set. If the problem persists, contact technical assistance.
99	[E]	Machine is powering down.	Wait for the power source to power down. During this stage, do not turn the power source back on by turning the mains switch because the power source would lock. Turn off the machine, wait for at least 30 seconds and turn back on.

11 TECHNICAL SPECIFICATIONS

Provided the impedance of the public low-voltage network at the point of common coupling (PCC) is lower than the Zmax value indicated in the tables below, this unit complies with IEC 61000 3-11 and IEC 61000 3-12 and can be connected to low-voltage networks.
It is the responsibility of the installer or user of the unit to ensure, by contacting the distribution network provider if necessary, that the network impedance is in compliance with the impedance restrictions specified.
The tables below show the technical data of the power sources for welding processes that can be used in manual mode (MIG/MAG and MMA) and in the field of automation (MIG/MAG only).

SYNSTAR 350 TS Item No. 379				
	MIG		MMA	
Mains voltage (U1)	3 x 230 V	3 x 400 V	3 x 230 V	3 x 400 V
Mains voltage tolerance (U1)	+15% / -20%			
Mains frequency	50/60 Hz			
Mains fuse (delayed action)	28 A	16 A	28 A	16 A
Apparent power	13.3 kVA 40%		13.6 kVA 40%	
	12.2 kVA 60%	14.2 kVA 60%	12.3 kVA 60%	14.2 kVA 60%
	11 kVA 100%	10.8 kVA 100%	11 kVA 100%	10.6 kVA 100%
Mains connection Zmax		60 mΩ		60 mΩ
Power factor (cosϕ)	0.99			
Welding current range	10 ÷ 340 A	10 ÷ 350 A	10 ÷ 320 A	10 ÷ 330 A
Welding current 10 min/40°C (IEC 60974-1)	340 A 40%		320 A 40%	
	320 A 60%	350 A 60%	300 A 60%	330 A 60%
	300 A 100%	300 A 100%	280 A 100%	280 A 100%
Open-circuit voltage (U0)	63 V	55 V	63 V	55 V
Usable electrodes			Ø 1.5 – 6.0 mm	
Max. gas inlet pressure	6 bar / 87 psi			
Performance	86%			
Idle state power consumption	33 W			
Electromagnetic compatibility class	A			
Overvoltage class	III			
Degree of pollution (IEC 60664-1)	3			
Degree of protection	IP23S			
Cooling type	AF			
Working temperature	-10 °C ÷ 40 °C			
Transport and storage temperature	-25 °C ÷ 55 °C			
Marking and Certifications	CE UKCA EAC S			
Dimensions (WxDxH)	527 mm x 1078 mm x 1398 mm			
Net weight	95 kg			

Motor generator power required: greater than or equal to 30 kVA.

SYNSTAR 400 TS Item No. 382		
	MIG	MMA
Mains voltage (U1)	3 x 400 V	
Mains voltage tolerance (U1)	+15% / -20%	
Mains frequency	50/60 Hz	
Mains fuse (delayed action)	25 A	
Apparent power	17.5 kVA 100%	
Mains connection Zmax	26 mΩ	
Power factor (cosϕ)	0.99	
Welding current range	10 ÷ 400 A	10 ÷ 380 A
Welding current 10 min/40 °C (IEC 60974-1)	400 A 100%	380 A 100%
Open-circuit voltage (U0)	57 V	
Usable electrodes		Ø 1.5 ÷ 6.0 mm
Max. gas inlet pressure	6 bar / 87 psi	
Performance	88%	
Idle state power consumption	33 W	
Electromagnetic compatibility class	A	
Overvoltage class	III	
Degree of pollution (IEC 60664-1)	3	
Degree of protection	IP23S	
Cooling type	AF	
Working temperature	-10 °C ÷ 40 °C	
Transport and storage temperature	-25 °C ÷ 55 °C	
Marking and Certifications	CE UKCA EAC S	
Dimensions (WxDxH)	527 mm x 1078 mm x 1398 mm	
Net weight	111 kg	

Motor generator power required: greater than or equal to 35 kVA

SYNSTAR 500 TS Item No. 383		
	MIG	MMA
Mains voltage (U1)	3 x 400 V	
Mains voltage tolerance (U1)	+15% / -20%	
Mains frequency	50/60 Hz	
Mains fuse (delayed action)	25 A	
Apparent power	25 kVA 40%	25 kVA 40%
	22 kVA 60%	22 kVA 60%
	16.5 kVA 100%	16.5 kVA 100%
Mains connection Zmax	30 mΩ	
Power factor (cosϕ)	0.99	
Welding current range	10 ÷ 500 A	10 ÷ 500 A
Welding current 10 min/40°C (IEC 60974-1)	500 A 40%	500 A 40%
	450 A 60%	440 A 60%
	400 A 100%	380 A 100%
Open-circuit voltage (U0)	57 V	
Usable electrodes		Ø 1.5 ÷ 6.0 mm
Max. gas inlet pressure	6 bar / 87 psi	
Performance	86%	
Idle state power consumption	33 W	
Electromagnetic compatibility class	A	
Overvoltage class	III	
Degree of pollution (IEC 60664-1)	3	
Degree of protection	IP23S	
Cooling type	AF	
Working temperature	-10 °C ÷ 40 °C	
Transport and storage temperature	-25 °C ÷ 55 °C	
Marking and Certifications	CE UKCA EAC S	
Dimensions (WxDxH)	527 mm x 1078 mm x 1398 mm	
Net weight	111 kg	

Motor generator power required: greater than or equal to 50 kVA

SHIPYARD Item No 1665